ENVIRONMENTAL DEFENSE
finding the ways that work

Attachment 1: Description of Emissions Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions on attachment 2.

Title: Develop more accurate emissions measurement and modeling methods for landfills and include them in a multi-sector cap-and-trade program. Until then, reward landfills emissions reductions giving them offset recognition in a market based program or pre-program.

Type of Measure (check all that apply):

☐ Direct regulation
☐ Monetary Incentive
☐ Voluntary
☐ Other Describe:
☑ Market-based compliance:
☐ Non-monetary incentive
☐ Alternative Compliance Mechanism

Responsible Agency: California Air Resources Board, California Integrated Waste Management Board

Sector:

☐ Transportation
☐ Other Industrial
☐ Agriculture
☐ Sequestration
☐ Electricity Generation
☐ Refineries
☐ Cement
☑ Other Describe: Landfills and Waste Management facilities

2020 Baseline Emissions assumed (MMT CO2 eq): To be determined

Percent reduction in 2020:

See below

Cost effectiveness ($/metric ton CO2E) in 2020:

See below

Description:

Environmental Defense believes that emission reductions from landfills should be achieved by inclusion in a multi-sector cap and trade program once more accurate emissions measurement

and modeling methods are developed. Until then, landfills should be allowed to generate offset recognition for emissions reductions in a market based program or pre-program provided that obstacles discussed in the section "Barriers to Implementation" are overcome. When covered by a multi-sector cap and trade program, CARB would set a total allowable limit on emissions from all sectors that are within the cap. Regulated entities would then be required to submit allowances equal to their emissions during each compliance period. Therefore, since the overall cap would be less than the current aggregate emissions, individual plants would be required to either reduce on-site emissions, purchase reductions from other capped facilities, or purchase qualified offsets.

Greenhouse gas emitted from landfills is generally methane and carbon dioxide. Methane is generated from the decomposition of organic matter and escapes primarily from fugitive sources like landfill surface caps, gas compressors and component connections. Carbon dioxide is directly emitted from the landfill by combustion devices that destroy of landfill gas (methane). These carbon dioxide emissions are called biogenic because they release carbon sequestered in plant matter (in the short term carbon cycle), and are not captured in the 1990 inventory. Carbon dioxide is also indirectly emitted from landfills because some landfills import electricity to run equipment.

Even though historic emissions from landfills have been dramatically reduced over the past 20 years, emissions from landfills today are still significant source of greenhouse gases in the state. Even after the conclusion of CARB's next rule making for landfills (a discrete early action item for AB32), GHG emissions from landfills will continue to be a significant source statewide.

Both the CARB mandatory reporting regulation workshops and the Market Advisory Committee June 2007 report indicate that current modeling technology does not allow for accurate emissions estimation from the surface of landfills. Although it is possible to measure captured landfill and digester gas accurately, this modeling gap means that information on a large proportion of emissions from the sector is unknown. For this reason, the MAC recommends these sources be candidates for an offset program or other regulatory measures rather than through a market based system. The MAC does not recommend placing biogenic carbon dioxide emissions under an offset program, and does not speculate what its recommendation would be if better modeling methods were present.

Emission reduction calculations and assumptions:

Calculating the overall emissions reductions (cap): The emissions reductions required under a multi-sector cap and trade program are determined by the extent to which the cap is below the actual level of emissions in covered sectors. One of the best aspects of a cap is that it is a limit on the total allowable emissions from sources covered in the cap. Other regulatory approaches, such as performance-based standards, may limit emissions associated with a given activity, but do not limit the amount of activity and thus do not put a limit on total emissions. Furthermore, by observing allowance prices in the marketplace, the real costs of economy wide emissions mitigation can be observed and used to inform future adjustments to the cap.

Similarly, the real costs of ratcheting the cap downward can be observed via changes in allowance prices.

We recommend a stringent multi-sector cap that is derived from an aggregation of sector-specific emissions reductions goals. CARB should also consider factors such as the size of the overall cap and trade market, the percentage of statewide greenhouse gas emissions that are under the cap, and the availability of offsets and linkages to beyond California in setting the cap. Ultimately, of course, the reductions required under the multi-sector cap and trade program, combined with reductions achieved through other measures, must equal or exceed the amount of reductions needed to reduce statewide greenhouse gas emissions to 1990 levels by 2020.

Estimating sector-specific emissions reductions: Several factors affect the calculation of an emissions reductions estimate for each sector. First, the number of emitting entities within each sector and cost curves for potential emissions reductions from that sector will help determine emissions reduction potential. Also, the contribution each sector makes to the overall California emissions inventory and cap-and-trade market is relevant. In addition, any sector-specific estimates rely, in part, on the historic emissions data for that sector. Further, the impact of other regulations applicable to each sector, along with cost and competitiveness factors unique to each sector, must also be assessed.

Cost effectiveness calculation and assumptions:

Economy wide cost effectiveness: There is a difference between a cost-effectiveness metric calculated as the costs per unit of emissions reduced and the idea of a program that is achieving reductions goals as least cost. Cap-and-trade policy ensures the latter. A cap and trade program creates incentives for emissions sources to find the least-cost options to achieve emission reductions. In a multi-sector cap and trade program, emissions sources have the option of pursuing on-site reduction strategies, purchasing emission allowances from other entities in any other sector under the cap that have been able to beat their own targets, or purchasing qualified offsets from entities not within the cap. This means that trading within and between sectors allows for market participants to seek out and implement the most cost-effective reductions strategies. The cost of emissions reductions achieved under a cap-and-trade program will be lower than the cost of those same emissions reductions achieved through an alternative policy instrument.

The total cost to society of meeting an emissions reduction goal is equal to the emissions mitigation costs incurred by the regulated entities plus the regulatory costs of administering and enforcing the program. Cap-and-trade programs typically involve lower regulatory costs than traditional command-and-control programs for at least two good reasons. First, there is no need for regulators to conduct detailed and time-consuming assessments and rulemakings about specific control technologies, such as establishing Best Available Control Technology measures. Second, the regulated entities have a financial incentive to demonstrate compliance because they can sell unused emissions credits.

Individual site and measure cost effectiveness: A major benefit of trading is that no *a priori* calculation of cost effectiveness by CARB will be needed because market participants will be incentivized to do this calculation internally for their unique reductions options and to then compare their internal options with the market-clearing price for emissions allowances. While the cost effectiveness of specific emission reduction strategies can be calculated as the cost of implementation divided by the amount of reductions achieved, with trading it is not clear that a specific reduction strategy will be used. This "flexible compliance strategy" makes moot the need to determine in advance which abatement methods will be best for individual facilities. Also, a cap-and-trade program eliminates the need for government agencies to estimate which strategies will be used at the facility level because the cap-and-trade program allows individual facilities (who are the ones best positioned to have that information) to weigh their options and then act in a manner that is in their best economic interest.

***Creating sector-specific cost curves*:** To determine how trading might evolve and to forecast allowance prices, we are actively researching sector-specific cost curves and will provide this information when complete.

Implementation barriers and ways to overcome them:

Lack of accurate surface emission modeling: Both the CARB mandatory reporting regulation workshops and the Market Advisory Committee June 2007 report indicate that current modeling technology does not allow for accurate emissions estimation from the surface of landfills. Although it is possible to measure captured landfill and digester gas accurately, this modeling gap means that information on a high proportion of emissions from the sector is currently not known with any degree of specificity. For this reason, the MAC recommends these sources be candidates for an offset program or other regulatory measures rather than through a cap and trade program. The MAC does not recommend placing biogenic carbon dioxide emissions under an offset program.

Environmental Defense recommends that CARB work closely with the CIWMB to develop accurate surface emission estimation models for landfills as part of its next round of mandatory reporting regulations. Once such models are developed and proven reliable, landfills should be considered for regulation under a cap and trade program. Further, CARB should work closely with the CIWMB to assure that necessary data for the CIWMB modeling development process is obtained from landfills. This data will include items such as waste-in place under active gas collection systems. Since the CIWMB does not have the level of data acquisition power that CARB has, CARB could serve as a conduit for data collection and also further develop internal expertise on emissions modeling form landfill surfaces

Landfill specific mandatory reporting requirements do not exist: To be included in a multi-sector cap-and-trade program, landfill methane emissions must be reported to CARB under a mandatory requirement. Once accurate surface modeling is generated, this should be possible.

Possibility of unintended consequences due to offset opportunities: As the MAC report suggests, landfills could provide offset opportunities through collecting landfill gas and turning it into energy, potentially reducing emissions and displacing fossil fuel. However, in design of such a system, CARB must use exercise care in order to not create perverse incentives that might paradoxically increase actual emissions from landfills. For example, ff an offset program incentivizes landfills to collect more organic wastes than they otherwise would have, it could undermine existing waste diversion programs and landfill organic matter reduction goals. Organic wastes such as construction debris, yard trimmings and food scraps should be placed into more efficient facilities such as composting or biogas manufacturing plants rather than into the landfill. These alternative destinations have proven to be more efficient at creating useful products such as usable soil and fuel without releasing GHG.

Cost of technology implementation: Since the cost of new technology in the landfill sector may be prohibitively expensive, CARB should improve incentives for companies to develop emissions reduction projects such as new waste diversion programs and biogas reduction through gas to liquid conversion. Further, incentives for projects that reward displaced grid electricity and liquid fossil fuel use in vehicles can enable facilities to pass certain monetary thresholds that prohibit the implementation of new technology. These incentives can be created by providing linkages between the landfill sector and any Low Carbon Fuel Standard the California developed. Further, CARB can improve the ability of landfills to participate in the renewable portfolio standard and acquiring renewable energy credits by facilitating the streamlining of permits at the local level for landfill gas to energy projects.

Not all landfills will meet necessary criteria to be included in a multi-sector cap-and-trade program or offset market: Landfills in the state differ with regards to a wide range of factors. Items such as a landfill's age, class, amount of waste, closure status, gas production quality and gas production quantity all effect the GHG emissions rate and ability of the facility capture and combust methane. In order for CARB to include landfills in a multi-sector cap-and-trade program, criteria for landfills would need to be developed and groups of facilities would need to be excluded. In essence, if a facility is not going to producing emissions, it should not be covered in an emissions trading system of offset market. To perform this assessment, CARB will need to perform a thorough evaluation of the fitness of various facility sizes and gas production abilities for the cap-and-trade. For these landfills, mandatory performance standards should be utilized to minimize emissions.

No protocol for fugitive emissions reduction measurement: Although the MAC recommended inclusion of methane emission reductions in an offset program, the tools required to allow such inclusion are yet not in existence. In such a program, emission offsets must be supported by a measurement methodology to make sure reductions are real, quantifiable, additional, and verifiable. This method must not only provide specific guidance to facilities to measure emissions that are escaping, but must also enable facilities to calculate difference between pre and post project emissions.

To overcome this lack in emissions measurement methodology, CARB must develop and adopt a protocol that can be uniformly applied to the state's landfills. The development of this protocol must involve stake-holders companies as well as the public.

Potential impacts on criteria pollutants

Increasing the overall combustion of landfill gas may lead to increased level of criteria pollutants such as NOx and CO. Traditional flaring technology is the worst emitter of these pollutants and solutions that increase flaring should be avoided. Solutions such as properly tuned IC engines and gas processing plants that form compressed / liquid gases will have less emissions due to the presence of back end emissions controls. Further, these solutions may displace formation of criteria pollutants in other areas by reducing the need for fuel.

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